

# PATENT SPECIFICATION

DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

### A Machine for Cutting Out Cloth or the like

I, KARL REICHERT, a German citizen of Waiblinger Strasse 211, Stuttgart-Bad Cannstatt, Germany trading as KRAUSS & REICHERT, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a machine for cutting out cloth or the like to be made into garments.

In the making of garments the usual procedure for cutting out the cloth for bespoke, i.e. made-to-measure, garments consists in marking out the contour of the required blank on the cloth and then cutting the cloth along the marked contour, whereas in the production of ready-made garments it is the practice to cut out a large number of blanks from a multi-layered stack of cloth or cloths. Even in simplified methods of performing the latter process special stacking machines for the cloth are required, and such stacking occupies a considerable amount of time. Moreover, the work of cutting out blanks from such a stack requires considerable skill.

The object of the present invention is to simplify the cutting out of blanks for garments from the cloth or the like. The invention is based on a method employed in the cutting of metals and the like, which consists in punching a series of overlapping holes in the material. This method has the advantage that the blanks which are to be cut out of the cloth can be spaced closely together without wasting material. If these series of holes are punched out by a series of punches the punching operation can be performed automatically by controlling the actuation of the punches directly from a pattern upon which the contours of the blank have been marked, for instance with a lead pencil.

According to the present invention I provide a machine for cutting out blanks from cloth or the like comprising punches for

punching out holes in the cloth, said punches being operated automatically, in accordance with a pattern fed through the machine, and on which the contour of the desired blank has been marked, adjacent punched holes overlapping to constitute a severing cut of the cloth.

The invention is illustrated diagrammatically in the accompanying drawings which illustrate a preferred embodiment thereof, by way of example, and in which:—

Fig. 1 is an end view of the machine, a facing panel therefor being partly broken away;

Fig. 2 is a longitudinal section of the punching assembly, the section being taken on the line 2—2 of Fig. 3;

Fig. 3 is a cross section of the punching assembly taken on the line 3—3 of Fig. 2;

Fig. 4 is a horizontal section of the punching assembly, taken on the line 4—4 of Fig. 3;

Fig. 5 is a longitudinal section of a pattern detecting assembly of the machine, taken on the line 5—5 of Fig. 6;

Fig. 6 is a cross section of the pattern detecting assembly, taken on the line 6—6 of Fig. 5;

Fig. 7 is a cross section of a detail of the pattern detecting assembly, taken on the line 7—7 in Fig. 5;

Fig. 8 is a longitudinal section on an enlarged scale of a detail of the pattern detecting assembly;

Fig. 9 illustrates a portion of a blank cut by a series of holes in conformity with a pattern;

Fig. 10 illustrates the general scheme of distribution of detectors and punches in transverse rows in the detecting and punching assemblies of the machine; and

Fig. 11 illustrates the general sequence of working phases which occur in one revolution of the drive shaft of the machine.

In carrying out the present invention, I

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cut out a blank from a piece of cloth 69, Fig. 9, in conformity with a given outline 20 by punching a series of overlapping holes 21 in the cloth. This is effected by passing the cloth 69 in intermittent steps beneath an assembly of punches 87 disposed according to a certain plan in an area extending the full width of the cloth. For operating the punches in conformity with a desired pattern, a pattern detecting assembly is provided with detecting elements 57, 61, Figs. 6 and 8. A pattern 34, Fig. 6, is fed through the detecting assembly in intermittent steps which synchronise with the intermittent feed of the cloth 69, the detectors responding to an outline marked out on the pattern, and causing a corresponding sequence of holes 21 to be punched in the cloth as it travels beneath the punching assembly. The holes 21, as shown in Fig. 9, overlap and a blank is obtained shaped according to the contour of the pattern. The lay-out of the detecting elements in the detecting assembly and the lay-out of the corresponding punches in the punching assembly need not be to the same scale. Reproduction may be on a different scale.

In order to permit the required number of punches and detecting elements to be accommodated so that the full width of cloth and pattern are covered thereby and so that neighbouring punches and detecting elements will overlap by a given amount, punches which have overlapping cross sections are located, as shown in Fig. 10, in four consecutive rows A to D. Punches *a* which in the transverse direction Q overlap the transversely neighbouring punch *b* by an amount *m* are located in a first row A, whereas punches *b* are located in a second row B. The next following punches *c*, *d* which overlap the preceding punches by like amounts *m* are located in the third and fourth rows C and D. The fifth punch *e* in transverse direction is located in the first row A and overlaps punch *d* in the fourth row D by the same amount *m* in the transverse direction. Assuming the diameter of the punches to be 3 mm and the lateral spacing of the centres of neighbouring punches to be 2 mm, then the amount of overlap will be 1 mm.

The principal components of the machine are shown in Fig. 1. In a casing 22, of which the end panel is shown partly broken away, is a motor 23, a magnetic clutch 24, and a chain drive 25. The chain which runs over a sprocket wheel 26 on the drive shaft transmits continuous synchronous rotary motion to two sprocket wheels 27 and 28. Sprocket wheel 28 is secured to a shaft 29 extending across the full width of the machine, one end of this shaft being mounted in bearing pedestals 30 in the detecting assembly and the other in bearing pedestals 31 in the punching assembly.

The detailed construction of the detecting

assembly will now be described with reference to Figs. 5 to 8.

The bearing pedestals 30 which are spaced transversely by cross members 32 support a baseplate 33. An elongated pattern indicated at 34 is fed over this baseplate. The pattern need not be as long as the cloth 69 and can be fed through the machine repeatedly after each pass, or replaced by a different pattern. However, if desired, an endless belt type of pattern could also be used. In order to guide this pattern through the machine there are provided an entry apron 35, Fig. 6, two endless belt conveyors 36 and 37, guide channels 38 and 39, two further endless belt conveyors 40 and 41, and an outlet apron 42. Above baseplate 33 which serves as a table is the detecting assembly proper.

This assembly is vertically slidable on upright posts 43 and loaded by compression springs 44. It comprises three plates 45, 46 and 47 with interposed spacing elements 48 and 49. All these members are held together by bolts 50 and 51, Fig. 6. 52 is a locating pin.

For raising and lowering the detector assembly an eccentric 53 is mounted on shaft 29, said eccentric acting on the movable detector assembly through a thrust member 54, Fig. 6, and depressing it against the resistance of the springs 44. The thrust member 54 is secured to spacing member 48 by screws 55. Plates 46 and 47 are provided with corresponding vertically aligning holes in which sleeves 57 are arranged to move slidably in the vertical direction, compression springs 58 which bear on clips 59 urging the sleeves into their lower position in the assembly. Sleeve 57 slidably embraces a detecting finger 61 coated with an insulating material 60, a compression spring 62, bearing at one end against plate 45 and its other end against a clip 63 on the finger 61, urging the latter likewise into its lower end position in the assembly.

Sleeve 57 and finger 61 are both formed of electrically conducting material and are connected by leads 64 with an amplifier 65, one such amplifier being associated with each sleeve and finger. From each amplifier leads 79 are taken to an electromagnet 66, Figs. 3 and 4, in the punching assembly of the machine.

The detector assembly functions as follows: The end face preferably circular, of each cylindrical finger 61 and the annular end face of the associated sleeve 57 are maintained in contact with the surface of the pattern 34 which is fed in an intermittent forward motion across the table. As soon as a lead pencil mark which contains graphite, or a similarly electrically conducting line marking, crosses or touches the end faces of sleeve and finger, an electrical circuit will be completed between sleeve 57 and finger 61. The circular sections have the advantage of ensuring that irrespec-

tive of the direction of the marking line on the pattern, an electrical circuit will be completed through at least one detector element whenever the pattern moves a step forward.

5 The punching assembly of the machine—illustrated more particularly in Figs. 2 to 4—is of somewhat similar construction to the detecting assembly. The bearing pedestals 31 which are rigidly spaced by cross members 67 likewise support a plate member 68 in the form of a table, said table in this instance simultaneously serving as a die for the punches.

10 The means employed for intermittently feeding a length of cloth, indicated by 69, through the punching assembly are of analogous construction to the feed means for the pattern in the detector assembly and comprise an entry apron 70, endless belt conveyors 71 and 72, guide channels 73 and 74, another pair of endless belt conveyors 75 and 76, as well as an exit apron 77. Above the base or die 68 is the punch assembly proper which is constructed as follows:—

15 Upright posts 78 are fitted into the die 68. Vertically slidably mounted on the upper ends of the posts is a cross beam 81 supported on bushes 82 which bear on compression spring 83 located in corresponding recesses in a bridge member 80 which is securely bolted to the two bearing pedestals 31. Suspended from a central pin 84 is a cloth holder plate 85. A compression spring 86 urges this plate in the downward direction so as to maintain the head of pin 84 in contact with the bottom of a recess in cross beam 81. Consequently, when the cross beam 81 rises, pin 84 and the cloth holder plate 85 will likewise be raised and release the cloth 69.

20 In a manner corresponding to the arrangement of the detector fingers 61, punches 87 are vertically slidably held in bridge member 80. The punches are urged into raised position by compression springs 88 which, on the one hand, bear against the cloth holder plate 85 and, on the other, against clips 89 on the punches. The die 68 is formed with holes 90 which align with the punches. Screwed into bridge member 80 adjacent each punch 87 is an upright pin 91 which carries a pivotally deflectable intermediate member 92 urged by a spring 93 into contact with an upper abutment 94 on pin 91. This intermediate member can be deflected from one end position into another so that in one position it will be located above punch 87 between the punch and cross beam 81, and in the other end position it will be out of vertical alignment with the associated punch.

25 The underface of cross beam 81 has projections 95, 96, etc., one such projection being coordinated with each punch, and the downward length of each projection being such that it will depress the associated punch 87 only if the intermediate member has been

deflectably interposed, and it will not make contact with the end of the punch if the intermediate member has been retracted. These intermediate members 92 are operated by the afore-mentioned electromagnets 66 through rods 97 (see particularly Fig. 4).

The cross beam 81 is lowered by an eccentric 98 keyed to mainshaft 29. Since the shaft rotates continuously, the cross beam 81 will vertically reciprocate without interruption.

70 The sprocket wheel 27, Fig. 1, which is likewise continuously driven by chain 25 imparts intermittent motion to a shaft 99 through a step gear or a Maltese cross motion, and said shaft transmits this intermittent motion to the endless belt conveyors 36, 37 and 40, 41; 71, 72 and 75, 76, ensuring a perfectly synchronised intermittent feed of the pattern 34 and cloth 69. The length of feed of each step is arranged to correspond with a spacing  $x$  (Fig. 10) between detector finger centres 61 or punch centres 87 across the width of the pattern or cloth.

The machine operates as follows:—

80 When the main driving motor 23 is switched on, mainshaft 29 will revolve continuously whereas feed shaft 99 revolves intermittently. The two eccentrics 53 and 98 operate the detecting and punch assemblies in a synchronous manner. To prevent the electrical circuits from being energised when the detectors make contact with base 33 before a pattern has been inserted, the face of plate 33 consists of an electrically insulating material. Assuming now that pattern 34, say a paper pattern, is fed into the machine at 35 and the cloth 69 at 70, then pattern and cloth will be forwarded by the intermittently operating conveyor belts 36, 37 and 71, 72 respectively and pass stepwise under the detecting and punching assemblies to the further conveyor belts 40, 41 and 75, 76 respectively.

95 In the course of each revolution of shaft 29, the pattern and cloth advance by one such step, this being represented in Fig. 11 by phase I. When the pattern and cloth remain stationary at the end of this step, the detector assembly descends, in phase II, on to pattern 34 in such manner as to bring all the detector elements into yielding contact with the surface of the pattern. At this instant voltage has not yet been applied. The current is not switched on until phase III has been reached. Any detector element 57, 61 which now bears on a pencil line on pattern 34 in such a way that this line intersects the circular cross section of the finger as well as the annular cross section of the sleeve, will therefore complete electrical circuits for energising the associated electromagnet 66. This likewise occurs in phase III.

100 Consequently, whilst the detector elements are still in contact with the detected pencil line, those punches which correspond with the relative detector elements will be operated. 130

Operation of the punches is effected by the descent of cross beam 81 and the entrainment of those intermediate members 92 which have been deflected by the operating rod 97 of the relative electromagnet 66, the corresponding projections 95 or 96 on the descending cross beam 81 thrusting the punches which are located below the deflected intermediate members 92 downward on to the die, whereas all other punches whose associated electromagnets 66 have not been energised and have not deflected the relative intermediate members will not be operated. The depression of the punches causes a hole to be punched in the cloth (or if a stack of cloth has been fed, into the stack) i.e. in phase IV). In phase V, when the punch reaches its lower end position, the current flowing through the relative detector element is interrupted, whilst the detector element still bears on the pattern. In the final phase VI the detector elements as well as the punches are raised again into normal position.

It will be understood by reference to Fig. 11 that the descent and subsequent withdrawal of a detector element covers phases II to VI, whereas the descent and subsequent withdrawal of a punch covers only phases IV to VI. All six phases together represent one complete revolution of the drive shaft 29.

The exact coordination of detectors and punches and the continuation of the process of detecting the marks on pattern 34 cause a row of holes to be punched in the cloth in such manner that the curve enveloping the sequence of holes will define a blank which corresponds in shape, on a larger or smaller scale, with the pencil outline of the blank marked on the pattern.

In other words, the continued punching operations cut a section of material out of the cloth 69, which corresponds with the contour that has been marked on the pattern.

It will be readily understood that modifications of the described machine may be effected within the scope of the appended claims. The electrically conducting outline on the pattern may be a printed impression. Moreover, instead of using mechanical contact by detector elements for closing electrical circuits, use could be made of photocell detecting devices, or of electromagnetic detectors which respond in a manner similar to detecting devices in sound reproducing machines to magnetic ink markings, or of detectors which make contact through holes punched into a card.

#### WHAT I CLAIM IS:—

1. A machine for cutting out blanks from cloth or the like comprising punches for punching out holes in the cloth, said punches

being operated automatically in accordance with a pattern fed through the machine and on which the contour of the desired blank has been marked, adjacent punched holes overlapping thereby constituting a severing cut of the cloth.

2. A machine according to Claim 1, wherein the punches are arranged in a plurality of staggered rows arranged consecutively in the direction in which the cloth is fed.

3. A machine according to Claim 1, characterised by the provision of a mechanism for effecting an intermittent stepwise forward movement of the cloth, the length of each step corresponding with the spacing between the centres of neighbouring punches.

4. A machine according to any of Claims 1 to 3, characterised by the provision of a continuously vertically reciprocating driving member to impart downward thrust to the punches, provided a selectable intermediate member, one of which is associated with each punch, has first been interposed between the driving member and the punch.

5. A machine according to Claim 1, having a pattern detecting assembly comprising a plurality of detecting elements corresponding in number and disposition with the number and disposition of the punches, said detecting elements responding to markings on the pattern which is fed through the machine in an intermittent step-wise manner in synchronism with the feed of the cloth.

6. A machine according to Claim 5, characterised in that each detecting element controls an actuating means which indirectly causes the descent of a punch associated therewith.

7. A machine according to any of Claims 4 to 6, having an electromagnet arranged through a linkage to deflect an intermediate member into and out of the path of action of the vertically reciprocating driving member in such manner as to operationally couple and uncouple the associated punch with or from said driving member.

8. A machine according to Claim 6, wherein each detecting element comprises a sleeve and a detecting finger slidably contained therein, but insulated therefrom, said elements upon being pushed with their end faces into contact with an electrically conducting contour marked on the pattern to define the outline of the required cutting, being electrically connected when said contour intersects or touches an annular section of the end face of the sleeve as well as a circular section of the end face of the finger.

9. A machine according to Claim 5 characterised in that the detecting elements function photoelectrically.

10. A machine for cutting out blanks from cloth or the like substantially as hereinbefore described with reference to the accompanying drawings.

STEVENS, LANGNER, PARRY &  
ROLLINSON,  
Chartered Patent Agents,  
Agents for the Applicant.

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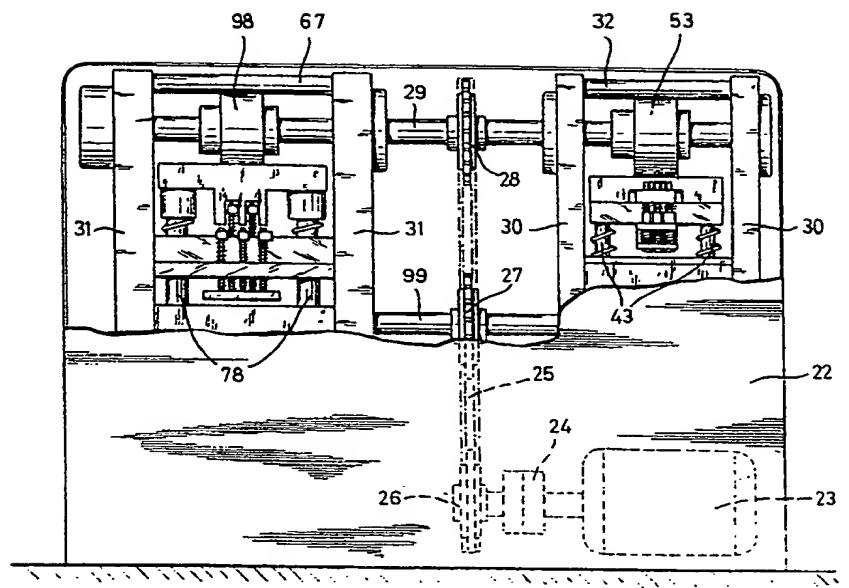


FIG. 1

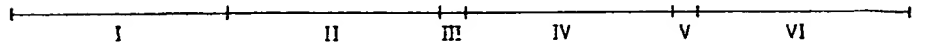


FIG. 11

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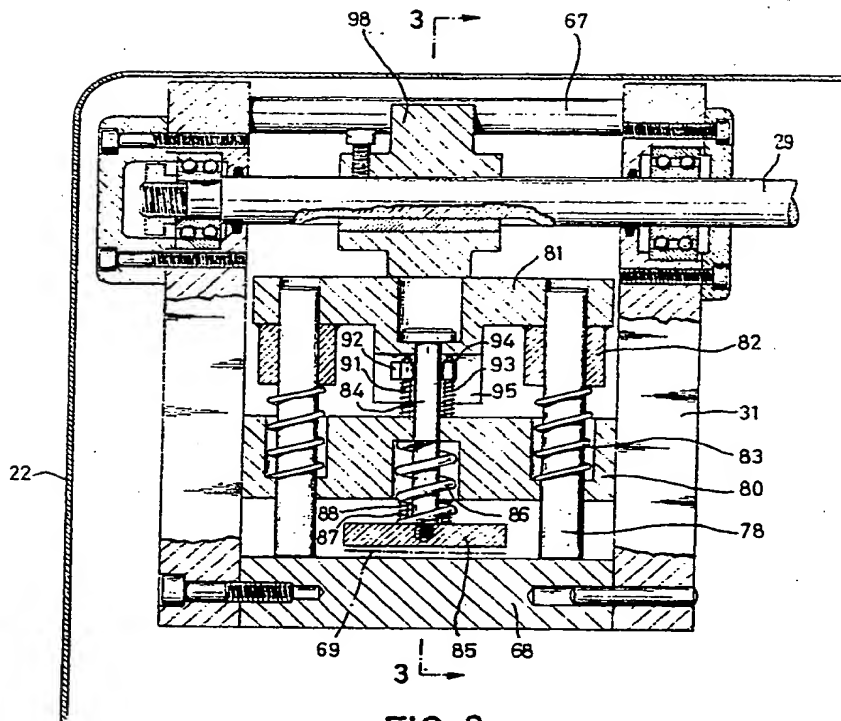
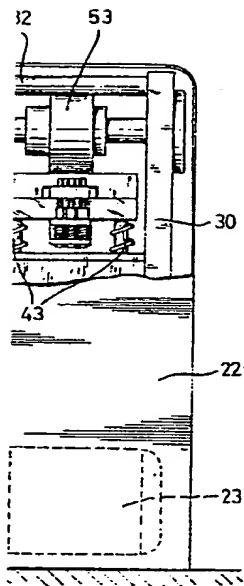
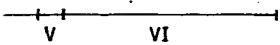


FIG. 2



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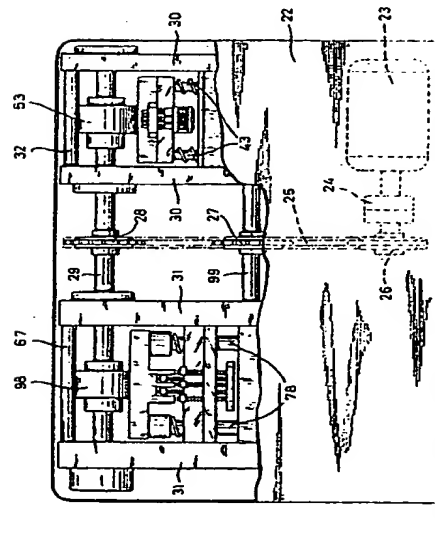


FIG. 1

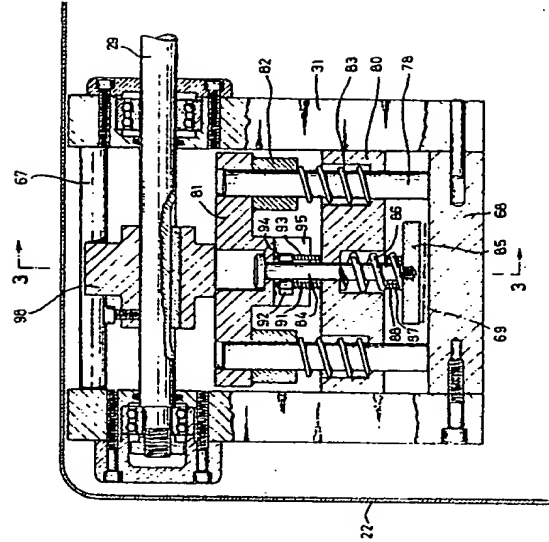


FIG. 2

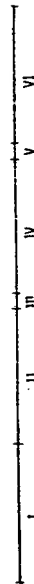


FIG. 11



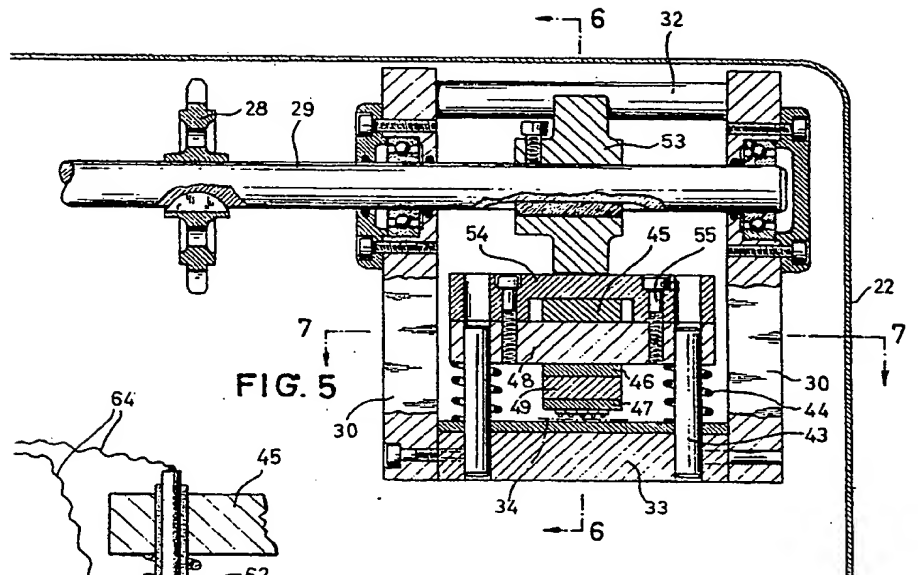


FIG. 5

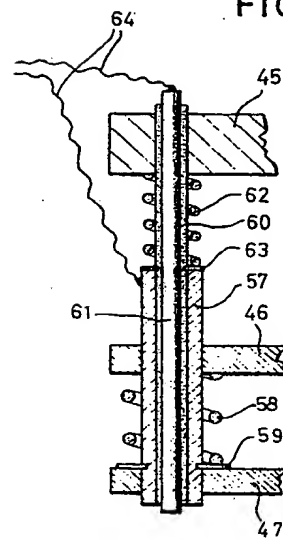


FIG. 8

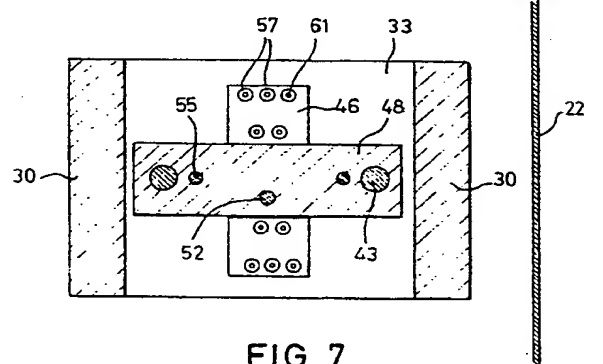


FIG. 7

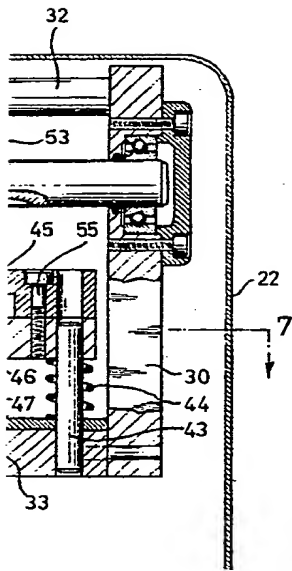
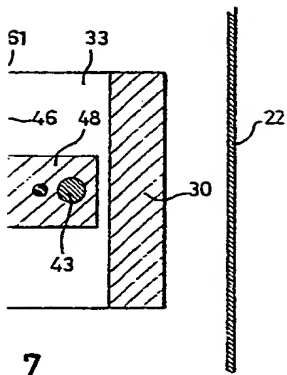
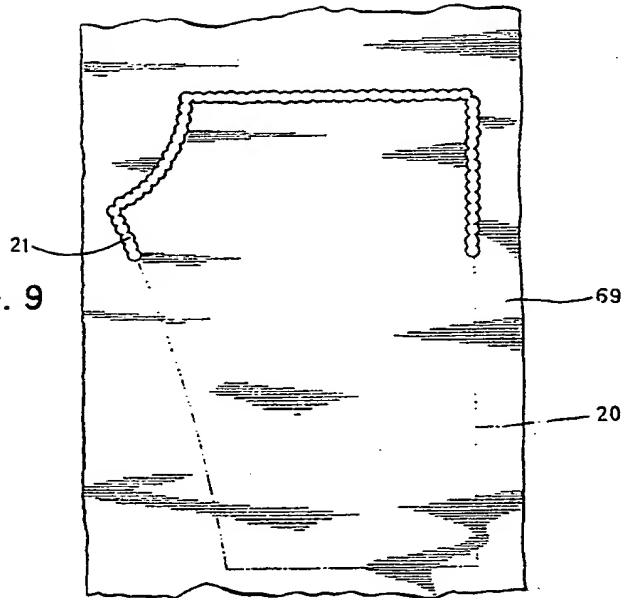
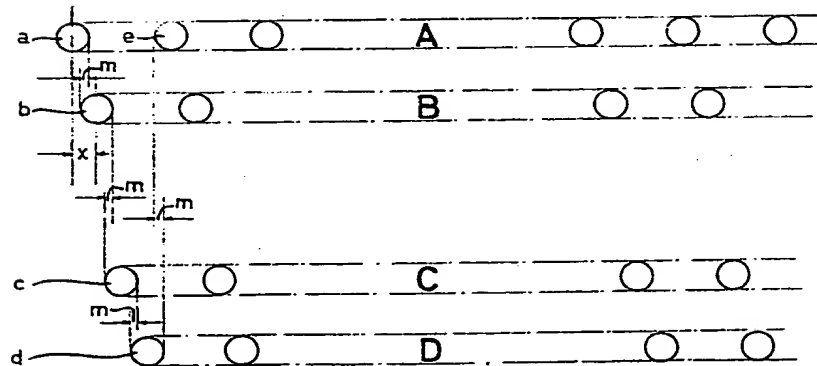


FIG. 9



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FIG. 10



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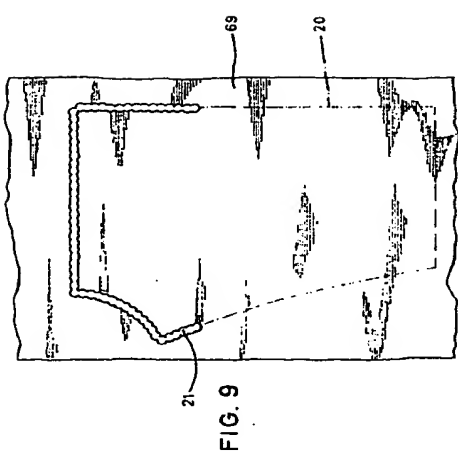


FIG. 9

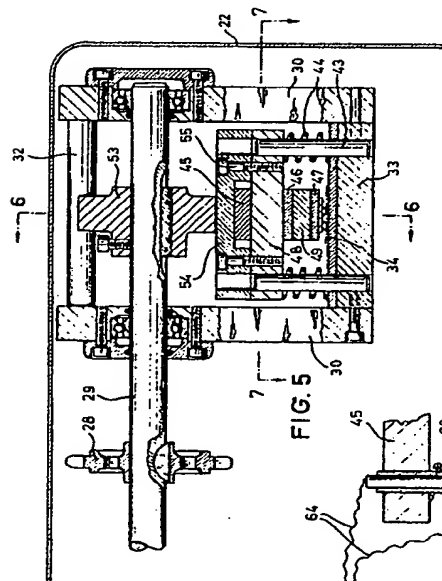


FIG. 5

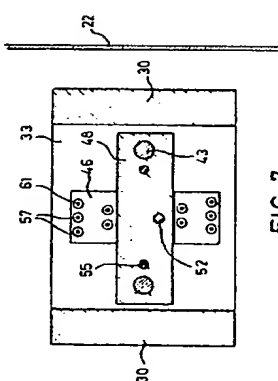


FIG. 7

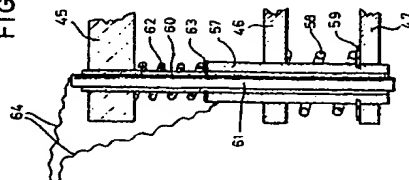


FIG. 8

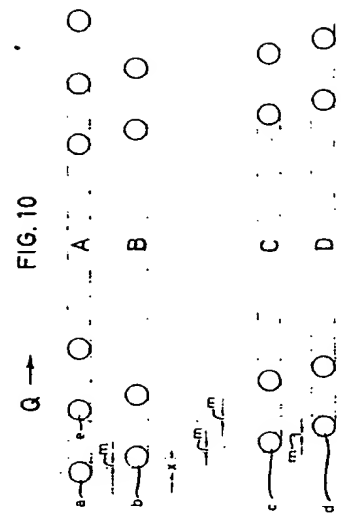
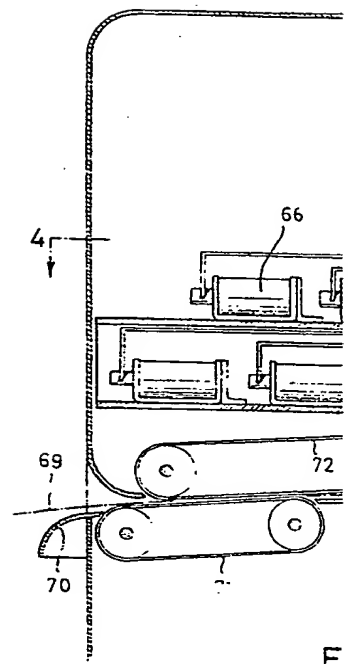


FIG. 10



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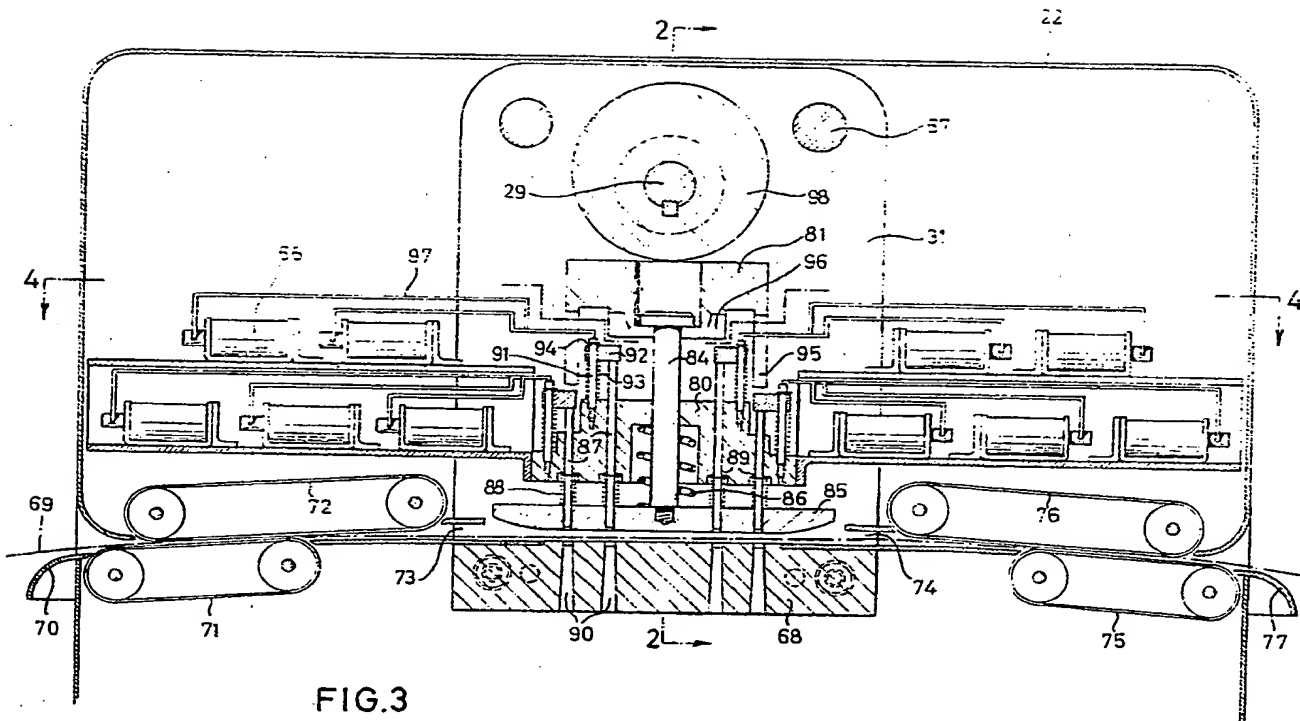


FIG. 3

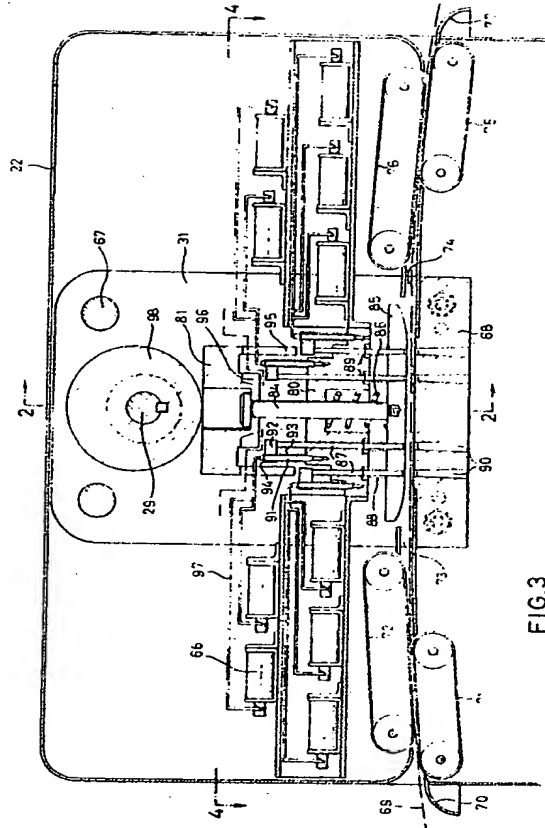
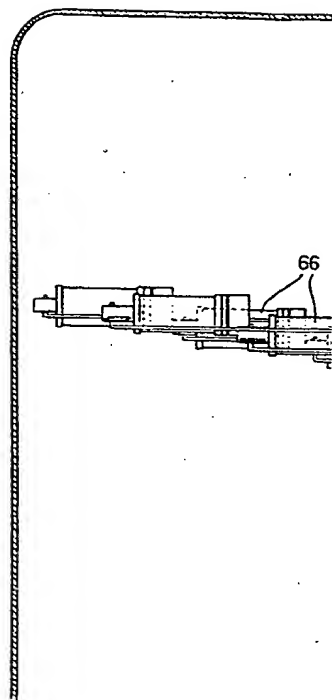
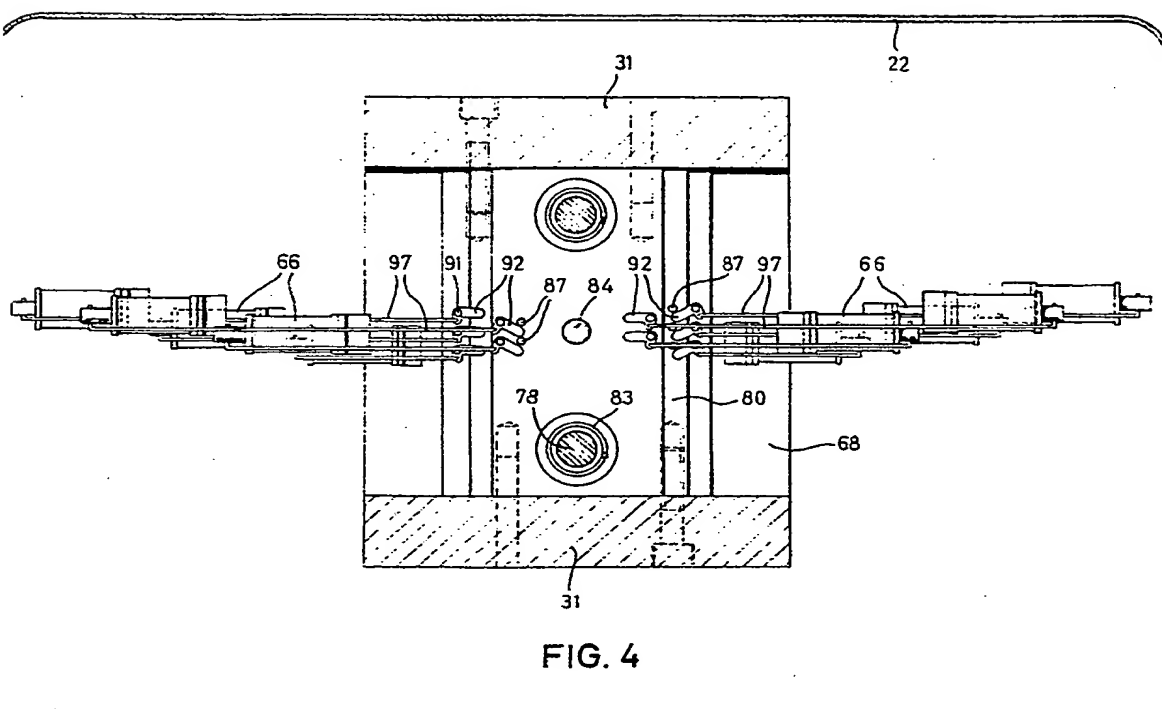


FIG. 3



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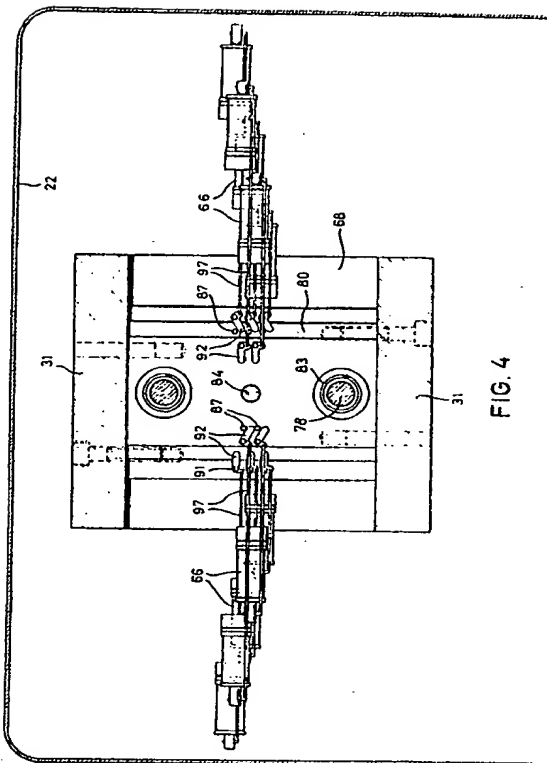
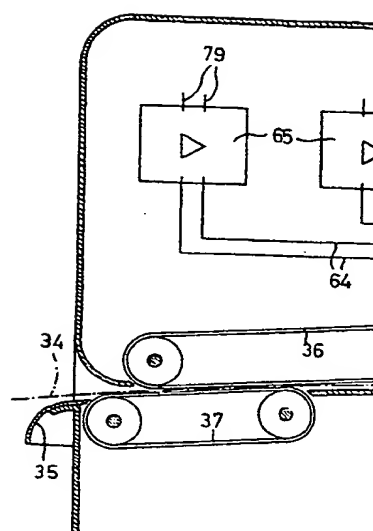
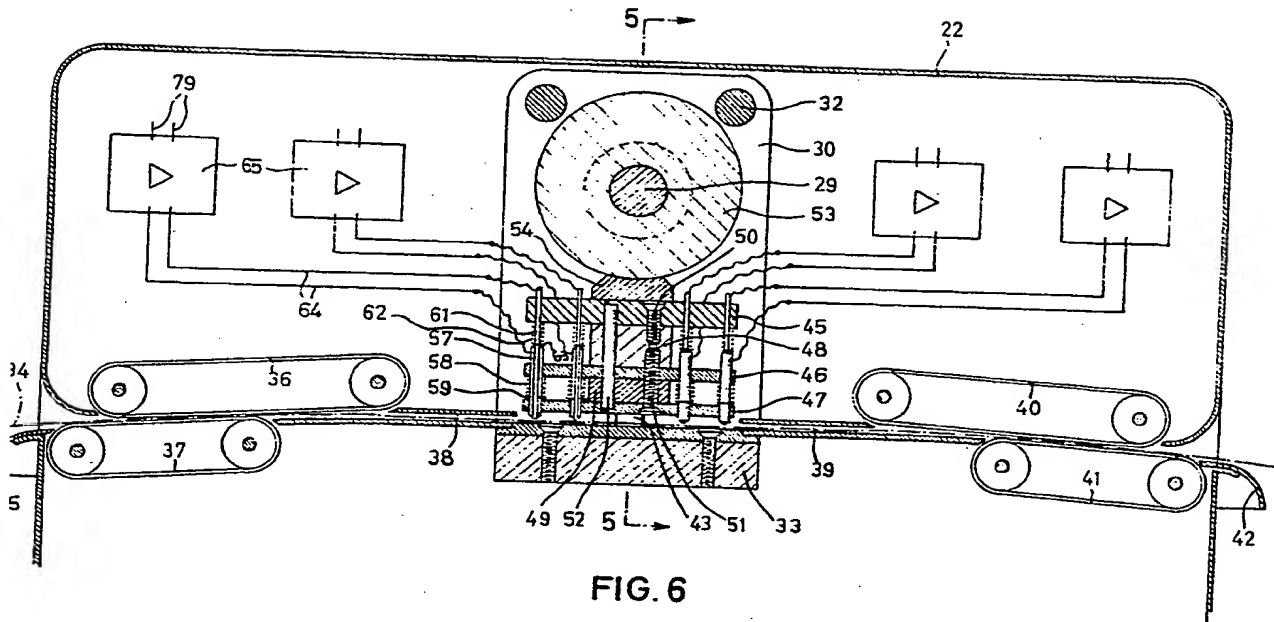


FIG. 4





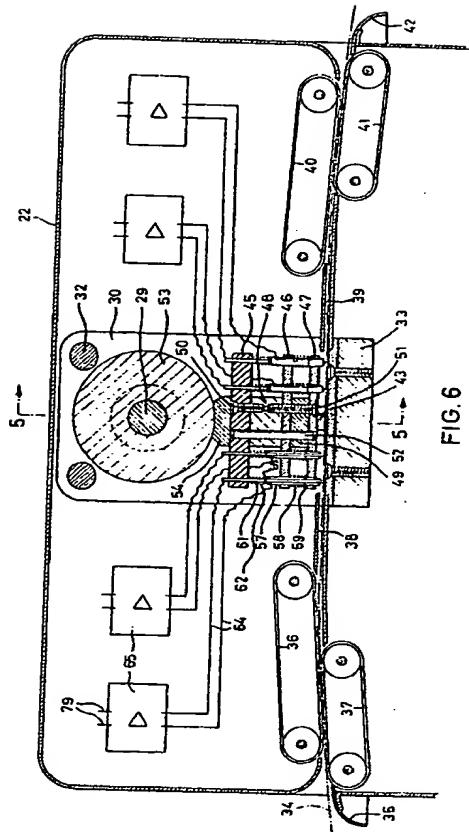


FIG. 6